plausible and simple would it certainly be were the sun a variable star that at different periods emits different quantities of heat; but for this or any other assumption there is no proof forthcoming. This enigma, like so many others, will some day be solved by man's searching intelligence, but, like all other acquisitions of science, this goal can be won only by assiduous and patient labour. Haply the triumph may not be for our generation; but what we may certainly accomplish is to prepare the way to it, by an accurate and critical collection of the facts.

H. F. B.

NOTES.

It is expected that about fifty foreign men of science will be present at the Leeds meeting of the British Association. A good many manufacturing firms have promised to open their works during the time at which the meeting is being held; and a Guide to Leeds and the surrounding district, with accounts of the various industries, is being prepared. There will, of course, be excursions to the more interesting places within easy reach of Leeds. The first *soirée* will be given by the Mayor, the second by the Executive Committee. The Yorkshire College will give an afternoon reception.

The London Mathematical Society has awarded the De Morgan Memorial Medal (given triennially) to Lord Rayleigh, Sec.R.S., for his researches in mathematical physics. The previous awards have been to Profs. Cayley and Sylvester. The medal will be presented at the annual meeting in November next.

The *conversazione* of the Society of Arts, as we have already announced, will take place at the Natural History Museum, Cromwell Road, on Friday, June 27. The galleries will be lighted with electricity, so that the authorities of the Museum will have a good opportunity of judging how far the electric light is suitable for the building. If the experiment is successful, the system will no doubt soon be permanently established. It may be hoped that in that case the public will not be excluded during an interval between twilight and the lighting of the electric lamps. That plan has been tried at the British Museum, and the results are not encouraging. If the national collections are to have a fair chance of attracting visitors, they must be open continuously from morning until the hour when they are closed for the night.

The anniversary meeting of the Royal Geographical Society was held on Monday, Sir E. M. Grant Duff, the President, occupying the chair. Mr. Douglas W. Freshfield announced that the Patron's Medal had been awarded to Emin Pasha, and the Founders' Medal to Lieutenant F. E. Younghusband. The Murchison Grant was awarded to Signor Vittorio Sella, for his journey in the Caucasus; the Cuthbert Peek Grant to Mr. E. C. Hore, for observations on the physical geography of Tanganyika; and the Gill Memorial to Mr. C. M. Woodford, for three expeditions to the Solomon Islands. Scholarships and prizes were awarded to students in training colleges. Dr. R. W. Felkin attended, upon instructions by telegram from Zanzibar, to receive the medal for Emin Pasha. The President, in handing the medal to Dr. Felkin, congratulated him upon having done much to make the work of Emin known in England. The Society was not based upon politics, and they simply saw in Emin Pasha one who had from early life given a great deal of attention to botany, natural history, and other subjects. Dr. Felkin, in acknowledgment of the medal, referred to the great services rendered by Emin Pasha to science. Afterwards the Report of the Council was read, and Sir E. M. Grant Duff delivered his presidential address.

At the meeting of the Scientific Committee of the Royal Horticultural Society on June 10, Mr. Morris called attention to the fact that the Royal Society had assigned £100 "on the recommendation of the Government Grant Committee, for an inquiry into the composition of London fog, with special regard to the constituents of fog injurious to plant life." An informal conversation followed with reference to chemical investigations to be undertaken at the laboratory of University College, under the superintendence of Dr. Oliver.

A deputation from the Sanitary Institute lately visited Brighton, and met the Mayor and other members of the Committee for the purpose of further considering the Congress and Exhibition to be held in the Pavilion buildings at the end of August. The large dome of the Pavilion, the Corn Exchange, and the Picture Gallery, are all devoted to the Exhibition, but the applications for space are considerably in excess of previous years, and probably some difficulty will be found in accommodating exhibitors. Sir Thomas Crawford is the President. At one of the meetings of the Congress a lecture will be delivered by Mr. W. H. Preece, F.R.S. Dr. B. Ward Richardson, F.R.S., will address a meeting of the working classes.

The thirty-seventh Report of the Department of Science and Art has been issued.

A lecture on the use of alloys in art metal-work, delivered by Prof. Roberts-Austen at the Society of Arts on May 13, is printed in this week's number of the Society's Journal. It is a lecture of great value and interest, and all who read it will cordially agree with the author that "an effort should be made to induce British artificers to employ the materials and methods which their Japanese brethren have used for centuries with such remarkable effect."

In France much interest is being taken in the question whether a University shall be established in Paris. At a meeting of the General Council of the Paris Faculties, held last Saturday at the Sorbonne, it was agreed that a University with five faculties (Protestant theology, law, medicine, science, and literature), and an upper school of pharmacy, should be formed. "The principal effects of the constitution of the University," says the Paris correspondent of the *Times*, "will be to permit the faculties to make arrangements for the organization of instruction (under the form of schools or institutes) of which the elements are at present scattered in several faculties, and to facilitate a sort of general instruction of a philosophical character, to which the professors of all the faculties will contribute, and which will be addressed to the students. The University will grant, besides professional degrees, diplomas of purely scientific studies to native and foreign students."

M. Deflers has just returned to France from his extremely arduous exploration of Southern Arabia at the instance of the Minister of Public Instruction in France. He has brought back large collections of both living and dried plants for the Museum of Natural History.

The Museum of Natural History in Paris has also received a considerable collection of dried plants gathered in Madagascar by M. Catat.

M. Balansa is about to return to Tonkin for the purpose of continuing his botanical explorations there; and M. Thollon to the Congo, from which he has already sent interesting collections.

A Laboratory of Vegetable Biology was opened at Fontainebleau on May 15. It is under the control of M. G. Bonnier, Professor of Botany at the Sorbonne, Paris, to whom applications for leave to pursue researches in the Laboratory should be addressed.

THE Königsberg Physikalisch-Oekonomische Gesellschaft has recently invited a comprehensive discussion of the observations of ground-temperature at Königsberg, published in the Society's *Schriften*, as bearing on our knowledge of heat-movements in the earth and their causes. Attention is called to a previous work by O. Frölich, published at Königsberg in 1868. For the best treatment of the subject a prize of £15 is offered. Papers (in any language), with motto, to be sent in before February 1, 1891.

Science announces that Lieutenant J. P. Finley, of the U.S. Signal Corps, has gone to San Francisco to take charge of the Pacific Coast weather service.

WE learn from *Science* that a work of great importance to navigators is to be undertaken in connection with the report of the U.S. Eclipse Expedition to West Africa, under the direction of Prof. D. P. Todd. This is the preparation of a set of daily weather-maps of both oceans from October to May inclusive, the entire period of the cruise of the U.S. steamship *Pensacola*. The U.S. Hydrographic Office calls attention to the importance of the subject, and the exceptional opportunity presented for utilizing the data already at hand, together with such additional data as may be contributed for this purpose by various Government offices and individual navigators. The scheme determined upon consists in the preparation of a weather map for each day at noon, Greenwich mean time, from October 1, 1889, to May 31, 1890, inclusive, for the entire area between latitude 70° north and 60° south, longitude 20° east and 100° west. In addition to the Greenwich noon observations that are kept regularly for the Hydrographic Office by nearly two thousand voluntary observers, it is earnestly desired that other navigators of these waters, within the limits of time and place mentioned above, may forward to that office such data from their log-books as may be useful in this connection, selecting those observations that come nearest to noon, Greenwich mean time, and stating as many details as possible regarding wind, weather, state of the sea, and velocity and set of currents. Data from land stations are also very important, especially such as are not accessible in any published records. To make this great undertaking a success, however, there must be further and cordial co-operation among the nations interested in the meteorology of this vast area, and among navigators of every nationality. It has long been the desire of the U.S. Hydrographic Office to begin the publication of a pilot chart of the South Atlantic and west coast of South America, and the present undertaking will furnish an admirable basis for this work.

A PAPER on the Mannesmann weldless tubes was lately read before the Society of Arts by Mr. J. G. Gordon, the chair being occupied by Sir Frederick Bramwell, who referred to the importance and interest of the subject, and to the extraordinary means by which the desired result was attained. The process consists in the solution of a purely kinematical problem, viz. the arranging of the velocity ratio of a pair of aconoidal rolls so as to change a solid piece delivered to them at one end into a hollow tube passed out at the other. These rolls revolve at about 200 to 300 revolutions per minute, and by their action on the hot and therefore plastic steel stretch it and make a hollow in the centre. The substance of the metal must be sufficiently homogeneous and plastic, and, in passing through the rolls, it undergoes a violent twisting and stretching action. The bar, in fact, in its passage through the rolls, is twisted as a thread is twisted in a spinning-machine, the material being drawn from the interior. This action was illustrated by one of the exhibits, which consisted of a bar, the ends of which were slightly drawn down under the hammer, so that the rolls could not act on them. A hollow was thus produced in the solid bar of metal, the contents of which were tested by Prof. Finke, of Berlin, and found to contain 99 per cent. of hydrogen of its total volume; the remaining 1 per cent. he considered to be probably nitrogen. In the carrying out of the process, 2000 to 10,000 horse-power is required for from 30 to 45 seconds, according to the dimensions of the tube. Although this is all the time actually required to convert a bar 10 to 12 feet long and 4 inches in diameter into a tube, a certain amount of time is required to adjust the guides, to deliver the bar to the rolls, and to remove the finished tube. The time so spent is employed to accumulate energy in a fly-wheel 20 feet in diameter, weighing 70 tons, and revolving 240 times in a minute, the periphery of which therefore revolves at 2·85 miles per minute; by this means, a steam-engine of 1200 horse-power is quite sufficient to do the work. A peculiar feature of these rolls is that the resulting tube is a test of the material and process. If the metal is homogeneous throughout, and well melted, well rolled, and carefully heated, it makes a perfect tube; but if there is a flaw in the metal, or if it has not been properly heated, the rolls cannot make a tube out of it. The paper, which was illustrated by photographs of the mills and engines, led to a very interesting discussion, in which Sir Frederick Bramwell, Prof. A. B. W. Kennedy, Mr. Alexander Siemens, and others took part.

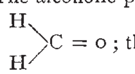
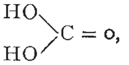
MESSRS. J. AND A. CHURCHILL have issued the fifth edition of Prof. F. Clowes's "Treatise on Practical Chemistry." The present edition contains several emendations and additions. The author explains that the work is intended to furnish a course of laboratory instruction in practical chemistry, which may precede the higher training of the professional and pharmaceutical chemist and the medical man, and the more special training of the technical chemist and the chemical engineer.

THE sixth volume of "Blackie's Modern Cyclopædia," edited by Dr. Charles Annandale, has been published. The volume begins with "Mona," and ends with "Postulate." The articles, like those of the previous volumes, are remarkably clear, concise, and accurate.

THE third number of the "Indian Museum Notes" consist of a careful paper on silkworms in India, by Mr. E. C. Cotes. The author confines attention to those species which are actually utilized in India for the production of silk.

MR. W. F. KIRBY, author of "A Synonymic Catalogue of Diurnal Lepidoptera," will publish shortly with Messrs. Gurney and Jackson, Mr. Van Voorst's successors, "A Synonymic Catalogue of Neuroptera Odonata or Dragon-flies." He hopes to bring out afterwards the first volume of his "Catalogue of Lepidoptera Heterocera," a work which has engaged his attention for nearly twenty years.

THE editor of the *Naturalists' Gazette* has in the press an "Illustrated Hand-book of British Dragon-flies," which will contain a full description of all the species indigenous to the British Isles, in addition to a quantity of other information.

A NEW gas, methylene fluoride, CH_2F_2, has been obtained by M. Chabrié, and a preliminary account of it will be found in the current number of the *Comptes rendus*. Its chlorine, bromine, and iodine analogues, CH_2Cl_2, CH_2Br_2, and CH_2I_2, have long been known. Methylene iodide is a liquid at ordinary temperatures which solidifies about 4° C. to brilliant leafy crystals. The liquid boils at 182°. Methylene bromide is a liquid boiling at 81°, and the chloride is also a liquid boiling at 41°. The fluoride, completing the graduation of the series, is now shown to be a gas. It is obtained by heating the chloride with silver fluoride. Methylene chloride is generally prepared from methyl iodide, which is placed in a retort, covered with water, and a stream of chlorine slowly allowed to pass through it. The very volatile methylene chloride distils over, as it is formed, into a condenser which is strongly cooled by a freezing mixture. In order to prepare the new gas, the methylene chloride is placed in a tube of Bohemian glass along with the proper quantity of pure silver fluoride, and the tube sealed before the blowpipe. It is then heated for half an hour to 180°. In an actual experiment 1·7 gram of methylene chloride and 5·08 grams of anhydrous silver fluoride, specially purified by the method described by Gore, were employed. Upon opening the tube, a great rush of gas occurs, which on collection and analysis is found to consist of methylene fluoride. The density of the gas compared with air was found to be 1·82, which agrees very closely with the theoretical density, 1·81, required for the formula CH_2F_2. Alcoholic potash is found to absorb it completely. Hence, in order to obtain a measure of the amount of carbon contained in the gas, a measured volume was absorbed in alcoholic potash and then treated with acetic acid and potassium permanganate. The alcoholic potash appears to convert it into formaldehyde,  $\begin{matrix}H\\H\end{matrix}\!\!>C = O$; this is oxidized by the potassium permanganate to carbonic acid,  $\begin{matrix}HO\\HO\end{matrix}\!\!>C = O$, and the acetic acid consequently liberates a volume of carbon dioxide equal to the volume of methylene fluoride experimented upon. This affords a ready mode of demonstrating at the same time the principal properties of the gas and its composition as regards the amount of carbon contained in it. Experiments are now in progress from which it is hoped some knowledge will be gained concerning its physiological action, which it will be interesting to compare with that described by MM. Regnault and Villejean in case of methylene chloride. In a recent communication by M. Moissan upon carbon tetrafluoride, CF_4, an account of which was given in NATURE (May 15, p. 67), it was recommended that metallic tubes should always be employed in these reactions with silver fluoride, inasmuch as fluorides of carbon attack glass with production of carbon dioxide and silicon tetrafluoride; for instance, $CF_4 + SiO_2 = CO_2 + SiF_4$. But M. Chabrié finds that if hard Bohemian glass is used, the product contains only mere traces of the two gaseous impurities mentioned, and, as glass is so much more convenient to manipulate, considers it advisable to use it. The methylene fluoride prepared in the above manner was quite sufficiently pure for all practical purposes.

THE additions to the Zoological Society's Gardens during the past week include a Common Marmoset (*Hapale jacchus*) from South-east Brazil, presented by Mr. Percy Standish; a Malbrouck Monkey (*Cercopithecus cynosurus* ♂) from the Upper Shire, two Grand Galagos (*Galago crassicaudata*) from Mandala, Shire Highland, East Africa, presented by Mr. John W. Moir; two Common Marmosets (*Hapale jacchus*) from South-east Brazil, presented by Mr. W. Norbury; a Common Fox (*Canis vulpes* ♂), British, presented by Mr. Atkins; a Great Crested Grebe (*Podiceps cristatus*), British, presented by Mr. T. E. Gunn; two Green Lizards (*Lacerta viridis*), three Wall Lizards (*Lacerta muralis*), a Dark-Green Snake (*Zamenis atrovirens*), four Common Snakes (*Tropidonotus natrix*), four Marbled Newts (*Molge marmorata*), an Edible Frog (*Rana esculenta*) from the South of France, presented by the Rev. F. W. Haines; eighteen Young Green Turtles (*Cheione viridis*) from Ascension Island, presented by Captain Robinson; a Silvery Gibbon (*Hylobates leuciscus*) from Java, deposited; a Philippine Paradoxure (*Paradoxurus philippensis*) from Zebu Island, Philippines, three Japanese Teal (*Querquedula formosa* ♂ ♀ ♀) from North-east Asia, purchased; an Angora Goat (*Capra hircus*, var., ♂), two Yellow-legged Herring Gulls (*Larus cachinnans*) bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on June 19 = 15h. 52m. 18s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 4244	—	Bluish.	16 43 56	+47 48
(2) 367 Birm.	6	Red.	15 59 21	+47 32
(3) α Serpentis	2	Yellow.	15 38 54	+ 6 46
(4) α Coronæ	2	Bluish-white.	15 30 0	+27 5
(5) U Cassiopeiæ... ...	Var.	Red.	0 40 11	+47 39

Remarks.

(1) The spectrum of this nebula, according to an observation made by Dr. Huggins in 1866, is a continuous one, but this result does not appear to accord with Smyth's description of it as "a fine planetary nebula, . . . large, round, and of a lucid pale blue hue." The G.C. description of it is: "Very bright, large; round; disk with faint, possibly resolvable, border." I know of no later observation of the spectrum than that referred to, but it is important that it should be confirmed, as the colour alone would lead to the supposition that there is something in addition to continuous spectrum. It is indeed possible that we have here a case of a nebula intermediate in condensation between those which give a spectrum of bright lines, and those which give a so-called "continuous" spectrum. In any case the apparent discrepancy between colour and spectrum should be investigated, for it is generally understood that planetary nebulæ with a bluish colour give bright lines.

(2) Dunér describes the spectrum of this star as a magnificent one of Group II. "All the bands 2–10, 6 included, and possibly 1, are visible. They are of extraordinary width and entirely black. The spectrum is totally discontinuous." The usual more detailed observations should be made.

(3) This star has a spectrum generally described as similar to the solar spectrum. The usual more detailed observations, as to whether the star is increasing or decreasing in temperature, are required.

(4) The spectrum of this star is a well-marked one of Group IV., but so far we have no information as to the temperature of the star relatively to others with almost similar spectra.

(5) The spectrum of this variable has not been recorded. The range of variation is from 8·5 to 14 in about 260 days. There will be a maximum about June 20. A. FOWLER.

OBSERVATIONS OF METEORS.—The May number of the *Monthly Notices* of the Royal Astronomical Society contains a catalogue of 918 radiant-points of meteors observed by Mr. Denning at Bristol since 1873, together with a mass of information pertaining to their determination. The total number of meteors seen from 1873 to 1889 was 12,083, and the paths of 9177 of these were registered. The following table shows the horary rate of apparition of the meteors during the various months of the year:—

January ...	6·5	July	11·3
February ...	4·9	August	11·3
March	6·6	September ...	10·3
April	6·6	October	11·8
May	5·2	November ...	11·3
June	4·9	December ..	8·9

The mean horary rate of apparition is therefore 8·3. This is less than would be observed from a place where there is no interference with the light and smoke of a large town, some observations made by Mr. Denning in a different locality increasing the mean horary number to 11·4.

The observations were almost equally distributed between the morning hours, and were usually made between the third and first quarter of the moon, because a bright sky is very effective in obliterating meteor-showers, and therefore moonlight meteors are commonly rare.

As to the relative numbers which appear during the night, the maximum appears to be attained between 2 and 3 a.m., when the rate is nearly double that observed in the early hours of the evening. Two or three meteors have frequently been noticed to appear at nearly the same time and from the same radiant, the probable explanation in such cases being that the